Appendix C

Means of Delivery

Smoke can be delivered to the target in numerous ways, from artillery and aircraft to grenades and generators. Your choice of delivery means will be determined by the amount of smoke needed, the distance to the target, and the availability of resources.

Artillery Munitions

The field artillery provides effective systems for rapidly placing smoke on distant targets. They use HC, WP, and RP projectiles.

Use artillery-delivered smokes to–

- Obscure enemy observers and target acquisition and guidance systems (for example, CLOS ATGMs).
- Isolate or segregate enemy formations.

In projecting smoke onto the battlefield, the field artillery uses three types of missions: quick smoke, immediate smoke, and special smoke.

Quick Smoke

The objective of a quick smoke mission is to obscure the enemy's vision or to conceal maneuver elements. The quick smoke mission equates to the normal HE adjust fire mission. Obscuring the enemy is required, but the urgency of the situation does not require immediate smoke procedures. Use a quick smoke mission to screen a small area of 150 to 600 meters for a period of 4 to 15 minutes.

Immediate Smoke

The objective of an immediate smoke mission is to obscure the enemy's vision immediately. Use an immediate smoke mission to obscure a point of 150 meters or less within 30 seconds for 1 1/2 to 5 minutes.

Special Smoke

The objective of a special smoke mission is to conceal a large area to protect or conceal maneuver forces for an extended period of time. Consider a special smoke mission when the size of the cloud makes a quick smoke mission impractical. This type of screen can vary from 400 to 2,400 meters in length.

Table 11 lists characteristics of artillery smoke munitions.

Table 11. Characteristics of artillery smoke munitions.

Type Round	Delivery System	Time to Build Effective Smoke	Average Burn Time	Range
WP	155 mm	½ min	1 to 1½ min	18,000 m
HC		1 to 1½ min	4 min	
WP	105 mm	½ min	1 to 1½ min	11,200 m
HC		1 to 1½ min	3 min	

Mortar Munitions

Mortars can provide good initial smoke coverage because of their high rate of fire, but their small basic load limits the size and duration of the cloud they can provide. They are the most rapid and effective indirect smoke delivery means available to the maneuver commander.

Use mortar-delivered smokes to obscure enemy observers and target acquisition and guidance systems, such as CLOS ATGMs, and to isolate or segregate enemy formations.

Table 12, on the next page, lists characteristics of mortar-delivered smoke munitions.

Table 12. Characteristics of mortar-delivered smoke munitions.

Type Round	Delivery System	Time to Build Effective Smoke	Average Burn Time	Range Min/Max
WP	4.2 in	½ minute	1 minute	920/5,650 m
WP	81 mm	½ minute	1 minute	70/4,595 m
WP	60 mm	½ minute	1 minute	75/1,629 m

Rockets

AH/lS and AH-60 helicopters can deliver smoke munitions using the Hydra 70 rocket launcher system. The Hydra 70 fires a 2.75-inch rocket, which has a WP warhead (M156).

Use helicopter-delivered rockets to—

- Identify/mark targets for CAS aircraft and artillery.
- Obscure enemy observers and ATGM and air defense (AD) systerns.

Table 13 lists characteristics of attack helicopter-delivered smoke rockets.

Table 13. Characteristics of helicopter-delivered smoke rockets.

Munition	Cloud Width	Cloud Duration
M156 WP Warhead	50 m	1 to 1½ minutes

Aircraft-Delivered Smoke

The M52 helicopter smoke generating system is still in the US Army inventory, but in January 1982 the Army Materiel Command (AMC) type classified it as Standard B. However, it is a very effective smoke delivery method against a low-technology enemy or one with limited air defense assets. The system contains a fog oil tank, an electrical pump to transfer fog oil to the spray apparatus, and jets on a spray ring to direct the fog oil into a hot exhaust. There, the oil is vaporized into a thick, dense, white smoke.

Table 14. Aircraft-delivered smoke characteristics.

System	Type Aircraft	Cloud Length	Cloud Duration
M52 Smoke Device	Low Performance	40 m x 6,580 m	3 to 10 minutes

The UH1 helicopter is the airframe for this system. **It is effective** when the UH1 flies at speeds less than 90 knots and at heights not to exceed 50 feet; this makes the helicopter extremely vulnerable to air defense systems. This system has application for uses in various low-intensity conflict operations (for example, counternarcotics operations, peacetime contingency operations, and counterinsurgency operations) when the enemy has relatively few air defense systems.

Table 14 lists the characteristics of aircraft-delivered smoke.

Rifle Grenades

Rifle grenades can deliver smoke to point and area targets up to 350 meters away from individual soldiers. The M203 and M79 grenade launchers and the MK19 automatic grenade launcher all can fire smoke grenades. The smoke cartridges include the M713 red smoke, M715 green smoke, and M716 yellow smoke cartridges.

Use rifle grenades to–

- Obscure snipers, enemy fighting positions, and heavy weapon emplacements.
- Provide immediate suppressive smoke to degrade enemy weapon guidance links or tracking.
- Conceal the movement of small tactical units (squad or smaller).

Table 15, on the next page, lists the characteristics of the 40-millimeter grenade launcher.

Table 15. Characteristics of 40-mm grenade launcher.

Cartridge for 40-mm Grenade Launcher	Type	Color	Burn Time
M676	Canopy	Yellow	60 to 90 seconds
M680	Canopy	White	60 to 90 seconds
M682	Canopy	Red	60 to 90 seconds
M713	Marking	Red	17 to 30 seconds
M715	Marking	Green	17 to 30 seconds
M716	Marking	Yellow	17 to 30 seconds

Smoke Pots and Smoke Hand Grenades

Smoke Pots

Smoke pots produce large volumes of white or grayish-white smoke for extended periods. They are the small-unit commander's primary means of producing small-area screening smoke. Pots are necessary for employing smoke on water, as the M4A2 floating HC smoke pot is the only smoke-producing system that floats.

Emplace smoke pots by hand, drop them from vehicles or helicopters, use them as a field expedient, or fasten them to the outside of armored vehicles. Ignite smoke pots either manually (M4A2 and ABC-M5) at the emplacement site or electrically from remote positions (ABC-M5 only). The pots can be fired individually, simultaneously, or in a long-burning chain. Smoke pots are used by all services.

Table 16 lists the characteristics of US Standard A smoke pots.

Smoke Hand Grenades

Smoke hand grenades produce either white smoke or colored smoke for short periods of time. Because they only produce small amounts of smoke, smoke hand grenades are not effective for screening smokes for units larger than one or two squads. Emplace smoke hand grenades by hand or manually ignite them with a trip wire. This technique is effective to deceive the enemy with a diversion. The average soldier can throw a grenade 30 to 35 meters. White smoke grenades are most often used to conceal individual vehicles; colored smoke grenades are used to mark or spot positions. All services have and use smoke grenades

Table 17, on the next page, lists current smoke hand grenades and their characteristics.

Table 16. Characteristics of Standard A smoke pots.

Type	NSN	Ignition	Burn Time (Min)	Weight (lb)		Possible Uses	Duration (Minutes)
				Filling	Total		
ABC-M5 30-1b HC	1365-00-598-52077	Ignite by manual matchhead or electrical squib	12	31	33	Small-area screens Small smoke curtains (Ground-based only)	12 to 22
M4A2 HC Floating	1365-00-598-5220	Ignite by manual fuze only Issued w/M207A1 fuze	10	27½	11	Small area screen. Small smoke curtains (ground based or over rivers, small streams, and other operations that require floating capability): may be helicopter-delivered	10 to 15

Warning

The M4A2 smoke pot must be vented for five minutes within 24 hours prior to ignition. Vent each M4A2 pot by folding back the tape from at least two of the emission holes.

Table 17. Smoke hand grenade characteristics.

Type	Smoke Color	NSN	Weight (lb)	Possible Use	Duration (Sec)
AN-M8 HC	White	1330-00-219-8511	1.6	Marking or Small-Area Screens	105 to 150
M18	Red	1330-00-289-6852	1.2	Marking	50 to 90
	Green	1330-00-289-6851			
	Yellow	1330-00-289-6854			
	Violet	1330-00-289-6853			

Generators

The mechanical smoke generator is a device that vaporizes smoke generator fog oil number 2 (SGF2). The vapor released condenses in the air as a white smoke. Currently, mechanical smoke generators are the only large-area smoke devices type classified Standard A. Table 18 lists generator systems and their characteristics.

Table 18. Smoke generator characteristics.

System	Prime Mover	Mobility	Obscuration Spectrum	On-Board Duration
M3A4	M998 HMMWV	Static	Visual, Near IR	1 hr
M157	M1037 HMMWV M1059 SG Carrier	Mobile	Visual, Near IR	48–96 min
XM56	M1037 HMMWV	Mobile	Multispectral	Developmental
LAMPSS	Developmental (Fully Tracked)	Mobile	Full Spectrum	Developmental

Armored Vehicle Grenade Launchers

Three types of launchers for tanks and armored reconnaissance vehicles are designed to rapidly generate small amounts of smoke to conceal or screen individual vehicles. The vehicle commander launches the grenades as soon as he is fired upon, so the driver can take evasive action behind the smoke. The launchers fire either AN-M8 HC and M34 WP grenades (M176 launchers) or L8A1 RP and M76 IR grenades (M239 launchers).

Table **19 gives the characteristics** of these self-defense grenades.

Table 19. Vehicle self-defense grenade characteristics.

Type		Total Grenades	Distance From Vehicle	Firing Arc	Time To Build Effective Smoke	Average Burn Time
Launcher	Grenade					
M176	HC, WP	8	30–40 m	90°	5 sec	90 sec
M226	HC	8	30–40 m	90°	6 sec	90 sec
M239	RP and Type III IR	12	24–30 m	110°	2 sec	1–3 min

Vehicle Engine Exhaust System

The VEESS is a vehicle-mounted smoke system that produces smoke by vaporizing fuel with the exhaust system. Vehicles that currently have the VEESS include the AVLB, CEV, M88A1, M60, Ml, M2, and M3 families of combat vehicles.

In a heavy brigade-size combined arms force scenario, the VEESS provides a significant reduction (up to 20 percent) in the vulnerability of MIs, M2/3s, and Improved Tow vehicles. When our forces use the VEESS, the lethality of BMPs from the 1- to 2-kilometer range decreases as much as 80 percent. In summary, the lethality of enemy tanks decreases about 20 percent at close range. Self-defense smoke provides significant protection in the close battle.

Safety

Safety with smoke and smoke delivery systems depends primarily on two things: characteristics of the smoke and safety for the weapon or delivery systems. Tables 20 and 21 identify safety constraints and measures for US smoke and delivery systems.

Table 20. Smoke safety constraints.

Smoke Agent	Problem/ Concern	Response/Prevention
SGF2	Can cause pneumonia	Wear respiratory protection (mask) when in high concentrations of oil smoke or after 4 hours in low concentrations of oil smoke (haze)
HC	Carcinogenic	Wear respiratory protection at all times when exposed to HC smoke
WP, RP	Explosive; Can cause severe burns; Causes respiratory irritation	Do not use near friendly troops
Violet Smoke	Carcinogenic	Same as for HC

Table 21. Smoke delivery systems safety.

System	Problem	Response/Prevention
Artillery, Mortars, Rockets	Munitions are explosive. All can produce friendly casualties	Do not use near friendly troops
M239 Grenade Launcher	RP and IR grenades explosive	Safety radius of 50 meters for exposed troops in combat, 100 meters in training
M203 Grenade Launcher	Grenades explosive	Do not use near friendly troops
M18 Grenade AV-M8 HC Grenade	Burning device	Do not pick up or move when lit; wear gloves and eye protection when igniting; safety radius of 5 meters from friendly troops
M5, M5 Smoke Pots	Burning device	Same as M18 grenades. Plus: When igniting, keep head well to one side of the top of the pot and out of the way of sparks or flame. DO NOT use the pull ring or safety pin to lift a pot. Vent M4A2s. Safe distance for electrical ignition of M5 is 50 feet.
Smoke Generator	Vaporized SGF2 (See Table C-10)	Exhaust of smoke is very hot. Safety radius of 5 meters. No smoking around generator. Keep fire extinguisher within arm's reach; always add fuel from the fuel tank side; store gas can at least 15 feet from running generator. DO NOT touch engine head with bare hands.